Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17PH3010** | **Duration :** | **3hrs** |
| **Sub. Name :** | **QUANTUM MECHANICS – II** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course Outcome** | **Marks** |
| 1. | a. | Hamiltonian of a system depends upon time - Discuss how to obtain the exact solution of the Schrodinger equation using time dependent perturbation theory. | CO1 | 15 |
| b. | Discuss how sudden approximation occurs when the Hamiltonian changes substantially for a short but finite interval of time. | CO2 | 5 |
|  | **(OR)** | | | |
| 2. | a. | Let us consider a system where in the perturbation is applied very slowly. Explain the approximation that can be applied on such a system based on the time dependent perturbation theory. | CO3 | 15 |
| b. | Give an account on Fermi-Golden rule. | CO1 | 5 |
|  |  |  |  |  |
| 3. | a. | Apply Born approximation to obtain the first scattering amplitude and scattering cross-section and discuss the validity of scattering by a square well-potential. | CO4 | 10 |
| b. | Describe the scattering by a screened Coulomb potential and calculate the scattering cross-section. | CO4 | 10 |
|  | **(OR)** | | | |
| 4. |  | Explain the scattering of a charged particle by another using Rutherford formula by the method of partial waves. | CO4 | 20 |
|  |  |  |  |  |
| 5. |  | Apply time dependent perturbation theory to semi-classical theory of radiation and use it to determine the conditions for allowed transitions. | CO4 | 20 |
|  | **(OR)** | | | |
| 6. |  | Give an account on the density matrix and explain in detail with an application. | CO4 | 20 |
|  |  |  |  |  |
| 7. |  | Develop the Klein-Gordan relativistic wave equation for a free particle and henceforth obtain the current and probability density. | CO5 | 20 |
|  | **(OR)** | | | |
| 8. |  | Derive the Dirac’s linear Hamiltonian for a free particle and find out the Dirac’s matrices for α and β. | CO5 | 20 |
|  | | **Compulsory:** |  |  |
| 9. |  | Using the two well known classical wave equations discuss the quantization of wave fields. | CO5 | 20 |